



USDA Foreign Agricultural Service

# GAIN Report

Global Agriculture Information Network

Template Version 2.09

Voluntary Report - public distribution

**Date:** 04/07/2006

**GAIN Report Number:** SW6012

## Sweden

## Oilseeds and Products

## Nordic/Baltic Biofuels Report

**2006**

**Approved by:**

Margaret E. Thursland  
Agricultural Counselor  
U.S. Embassy Stockholm

**Prepared by:**

Asa Lexmon  
Agricultural Specialist

---

**Report Highlights:**

Finland and Sweden are both among the leading countries in the world in utilization of renewable resources for energy production. In September 2005, Sweden's Prime Minister Goran Persson announced a new policy target to create the conditions necessary to break Sweden's dependence on fossil fuels by 2020. Thanks to abundant forest resources, Sweden and Finland have well-developed energy systems for wood. In 2004, biofuel's share of total energy consumption was 20% in Finland and 17% in Sweden.

---

Includes PSD Changes: No  
Includes Trade Matrix: No  
Unscheduled Report  
Stockholm [SW1]  
[SW]

**TABLE OF CONTENTS**

|   |          |
|---|----------|
| <b>OVERVIEW .....</b>   | <b>3</b> |
| <b>BIOFUELS IN SWEDEN .....</b>                                       | <b>4</b> |
| Government Support of Biofuels for Transportation.....                | 4        |
| Ethanol .....   | 5        |
| Domestic Production and Consumption of Ethanol .....                  | 5        |
| Swedish Ethanol Industry Dependent on Imports .....                   | 5        |
| Closing of Ethanol Loophole a Boon for Swedish Production? .....      | 6        |
| Potential Lies in Wood Ethanol .....                                  | 6        |
| Biodiesel (RME) .....   | 7        |
| Domestic Production and Consumption of Biodiesel.....                 | 7        |
| Increased Biodiesel Production Good for Swedish Rapeseed Farmers..... | 7        |
| <b>BIOFUELS IN FINLAND .....</b>                                      | <b>8</b> |
| Finland Leading in Utilizing Renewable Energy Sources .....           | 8        |
| Action Plan for Renewable Energy Resources .....                      | 8        |
| Ethanol and RME in Finland.....                                       | 8        |
| <b>BIOFUELS IN LATVIA AND ESTONIA.....</b>                            | <b>9</b> |

## OVERVIEW

Finland and Sweden are both among the leading countries worldwide in the utilization of renewable resources for energy production. In September 2005, Sweden's Prime Minister Goran Persson announced a new policy target to create the conditions necessary to break Sweden's dependence on fossil fuels by 2020.

Thanks to abundant forest resources, Sweden and Finland have well-developed energy systems for wood. Biofuel's share of total energy consumption in 2004 was 20% in Finland and 17% in Sweden. Today, wood is mainly used as an energy source for heating. However, it is anticipated that wood will be utilized in Swedish ethanol production in the future. The use of renewable energy in Estonia and Latvia is currently low but both countries are exploring the potential for wood and other renewable energy sources.

When it comes to liquid biofuels (ethanol and biodiesel), Sweden is definitely the largest consumer in this region. This is due in large part to measures taken by the Government of Sweden to promote the utilization of biofuels and other renewable fuels, mainly through tax incentives. Unlike many other EU countries, the Swedish liquid biofuel industry is firmly focused on ethanol. Volvo, Saab and Ford all have "clean" flexible fuel vehicles currently available on the Swedish market.

More than 80% of total Swedish ethanol consumption is sourced in Brazil.

Finland is one of the world's leading countries in utilizing renewable energy sources, especially bioenergy. Wood and wood-based fuels play an important role within the Finnish energy system. Hydropower, wind power and solar energy are also important forms of renewable energy in Finland.

Latvia's fuel industry is showing increased interest in producing biodiesel. The company SIA BioVenta plans to start production of 100,000 MT by the end of 2006. In addition, the company SIA ECO DIESEL plans to start operating a biodiesel plant in 2007 with a capacity of 80,000 MT. Together, these two Latvian biodiesel plants would consume 550,000 MT of rapeseed per year. While most of this rapeseed will be imported, some of it will be grown domestically.

At a conference in Helsinki in October 1999, the Energy Ministers of the Baltic Sea Region Countries and the European Commission joined forces on regional energy strategies forming the Baltic Sea Region Energy Cooperation (BASREC). The countries and institutions participating in BASREC include the Governments of Denmark, Estonia, Finland, Germany, Iceland, Latvia, Lithuania, Norway, Poland, Russia and Sweden as well as the EC's Directorate General for Transport and Energy (DG TREN), the Council of Baltic Sea States, the Nordic Council of Ministers and the Council of Baltic States. <http://www.cbss.st/basrec/>

## BIOFUELS IN SWEDEN

With its abundant forest resources, Sweden has succeeded in developing efficient energy systems based on wood. The use of bioenergy in Sweden is increasing every year. In 2004, biofuel's share of total energy consumption in Sweden was 17%. Heating is the main market for bioenergy but large-scale use of liquid biofuels for transport also has good potential.

The share of biofuels produced from agricultural products is still rather small. About 2% of Sweden's agricultural land is used for energy production (see below).

Table 1. Cultivation of Agricultural Raw Material for Biofuel Production

| Raw Material               | Area, in hectares |
|----------------------------|-------------------|
| Grains, ethanol            | 25,000            |
| Grains, heating            | 5-10,000          |
| Straw, heating             | (30,000)*         |
| Rapeseed, RME              | 2,000             |
| Salix, heating             | 14,000            |
| Reed Canary Grass, heating | 600               |
| Grassland                  | 300               |

\* Bi-product from grains.

According to the Swedish Board of Agriculture, it takes 2.65 metric tons of wheat to produce 1 m3 of ethanol - or 3.36 tons to produce 1 metric ton. For rapeseed, the conversion factor is 2.5 metric tons to produce 1 m3 of biodiesel (RME) - or 2.83 tons to produce 1 metric ton.

### Government Support of Biofuels for Transportation

Within the EU, Sweden is firmly in the forefront with regard to biofuel utilization within the transportation sector. The Government of Sweden (GOS) set a national target for 2005 with the goal that biofuels must comprise at least 3% of total gasoline and diesel consumption for transport operations, calculated on the basis of energy content. In September 2005, Sweden's Prime Minister Goran Persson announced a new policy target to create the conditions necessary to break Sweden's dependence on fossil fuels by 2020.

Sweden, along with Spain, has requested that the European Commission establish a new Directive on the quality of petrol and diesel fuels to permit gasoline to contain 10% ethanol, rather than the current 5%.

Sweden promotes the use of ethanol and biodiesel through tax relief. Without tax relief, these fuels would be unable to compete with conventional gasoline and diesel at today's production costs. Total energy taxes for gasoline and diesel amount to about € 0.08/ KWh and € 0.05/KWh, respectively. These taxes represent about 30% of the price for gasoline and about 40% of the diesel price. There are no energy taxes for ethanol or biodiesel.

In addition, the Swedish government promotes the use of ethanol and biodiesel through lower taxes on and free parking for "clean" vehicles. The Swedish Road Administration defines a clean vehicle as one that runs with renewable fuels if they are not too fuel consuming, as well as very low consumer petrol and diesel cars if their emissions of nitrogen oxide and particle matter are relatively low. Companies that use clean vehicles in their fleets receive a 30% investment subsidy. The Swedish government has also proposed to abolish the VAT on biofuels.

Volvo, Saab and Ford all have clean flexible fuel vehicles currently available on the Swedish market. Volvo and Saab have also announced plans to introduce hybrid vehicles within the next few years.

Sales of clean vehicles have been hampered by the fact that there were not enough gas stations offering biofuel at the pump. In December 2005, however, the Swedish government imposed a regulation requiring that larger gas stations sell at least one type of biofuel. Gas stations selling more than 3,000 cubic meters of fuel per year (60% of total Swedish gas stations) are affected by this new requirement. In 2006, the Swedish government set aside SEK 50 million (USD 6.25 million) for this purpose and additional SEK 100 million (USD 12.5 million) in 2007.

## Ethanol

### Domestic Production and Consumption of Ethanol

Ethanol is the most common liquid biofuel in Sweden, comprising almost 90% of all liquid biofuel use in 2004. It is considered the highest potential biofuel with regard to production as well as consumption. About 80% of Sweden's ethanol production is based on cereals. The remaining 20% is based on wood through fermentation of sulphite liquor, a by-product of chemical paper pulp production.

Cereal-based ethanol is the additive used to reach the 5% ethanol requirement for gasoline in Sweden. Ethanol produced from sulphite liquor is utilized in 85% ethanol (E85) for clean flexifuel vehicles. As stated above, the GOS is seeking to have the European Commission change the current EU Fuel Directive (98/70/EG) which requires a 5% ethanol blend to a higher 10% compulsory blend. Should the Swedish government get its way, the demand for ethanol in Sweden would increase by about 200,000 MT per year.

Swedish consumption of ethanol has increased substantially over the past year. The Swedish government's promotion of biofuel utilization has certainly helped the rapid increase of consumption of ethanol. Expectations are that consumption will continue to increase, which is also reflected in increased sales of clean cars and buses. About 15% of new car sales during the last quarter of 2006 are expected to be clean cars.

Table 2. Ethanol Consumption in Sweden 1998-2004 (in 1,000 MT)

|                        | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 (est) |
|------------------------|------|------|------|------|------|------|------|------------|
| Consumption of ethanol | 11   | 13   | 17   | 50   | 58   | 135  | 205  | 310        |

### Swedish Ethanol Industry Dependent on Imports

Sweden's rising ethanol consumption is based on imports. More than 80% of total Swedish ethanol consumption is sourced in Brazil. Swedish ethanol production totaled approximately 52,000 MT in 2004.

The EU has required that 5.75% of energy used for transportation in 2010 shall be from biofuels. If Sweden were to meet that requirement through domestic biofuels, ethanol production would need to grow about 12 times current production. For 2005, Sweden has

set a more ambitious goal of 3% ethanol utilization for transport, compared to the EU's goal of 2%. At present, it is thought that up to 30% of current gasoline and diesel utilization can potentially be replaced by ethanol.

### **Closing of Ethanol Loophole a Boon for Swedish Production?**

In the short run, Sweden must increase ethanol imports in order to fulfill growing demand. Prospects for higher domestic production have improved since the GOS closed a loophole that allowed imports of ethanol at a reduced duty rate.

Under the old loophole, ethanol imported to reach the required 5% biofuel blend could be classified under the "other chemicals" tariff line by mixing the ethanol with 20% gasoline. "Other chemicals" are subject to a lower tariff (about €0.025 per liter) than plain ethanol intended for the 5% blend (€0.192 per liter). Ethanol imported under the "other chemicals" tariff code could also benefit from Swedish tax relief for biofuels. Reportedly, all Swedish ethanol importers took advantage of this loophole.

Effective January 1, 2006, tax relief is only available for ethanol imported under the higher €0.192 per liter duty. The import price is eventually expected to rise by about €0.16 per liter as a result of the closed loophole. On January 2, 2006, one of Sweden's largest petrol suppliers announced a price increase of €0.005 per liter due to the higher tariff.

Closing the loophole will probably not have a huge effect on domestic ethanol production in the short run. However, a price increase for imported ethanol of €0.16 per liter will substantially improve the competitiveness of domestic production. The cost to produce one liter of ethanol made from wheat in Sweden is estimated at SEK 4.45 (€0.47). Prior to closure of the loophole, import prices were about SEK 3.61 (€0.38) per liter – approximately a 20% advantage. At the higher tariff rate following closure of the loophole, import prices are expected to settle around SEK 4.48 (€0.48) per liter – slightly higher than the cost of domestic production.

Despite the loss of a price advantage, dependence on imported ethanol is expected to continue for another ten years due to the lag in technology and infrastructure development.

### **Potential Lies in Wood Ethanol**

Two Swedish companies produce ethanol for biofuel: Agroetanol and Domsjo Fabriker. In addition, the company Etek is running a GOS-financed pilot project to produce ethanol from wood raw material.

Agroetanol is the largest ethanol producer with a yearly capacity of 43,000 MT and plans for expansion. The company produces ethanol from wheat, barley and rye cultivated in neighboring areas. This ethanol is used for the 5% mandatory ethanol blend in gasoline. Wheat comprises two-thirds of the raw material. Swedish cereal production is between 5.0 and 5.5 million tons per year, out of which 0.15 million tons are currently utilized in ethanol production (25,000-30,000 hectares).

Domsjo Fabriker produces ethanol for E85 clean vehicles from sulphite. This company has a capacity of about 10,000 MT (13,000 m<sup>3</sup>) of ethanol per year.

The greatest potential for increased domestic production of ethanol in Sweden lies in wood ethanol. Etek's pilot project has resulted in the construction of a pilot plant which began operations in early 2005. Production costs are currently high but are expected to decline

substantially in the future – but not lower than the cost of producing ethanol from sugar in Brazil. Further expansion in Swedish production capacity for wood ethanol is expected to take place in about five years.

## Biodiesel (RME)

### Domestic Production and Consumption of Biodiesel

Biodiesel utilization in Sweden has not developed as rapidly as ethanol. Swedish biodiesel (rapeseed methyl ester or RME) is produced from rapeseed. Current domestic RME production in Sweden is relatively small, amounting to about 7,000 MT. About 50% of the rapeseed used for RME production is imported, mainly from Germany and Denmark.

Swedish regulations allow a 2% blend of biodiesel in conventional diesel. The Swedish government has, however, promised to raise the allowed blending to 5%. The company Karlshamn is currently the sole biodiesel producer in Sweden. Karlshamn is expanding its capacity through the construction of a new biodiesel plant. Production will begin in late April 2006 and total about 40,000 MT per year.

In addition, in November 2005, Preem Petroleum and Pestorp announced that they are jointly developing a biodiesel production plant with yearly production of about 53,000 MT. Production is expected to start in January 2007. The goal is to increase production every year until it meets Sweden's demand for biodiesel intended for blending with conventional diesel.

Table 3. RME Consumption in Sweden 1998-2004

|                      | 1998  | 1999  | 2000  | 2001  | 2002  | 2003  | 2004  |
|----------------------|-------|-------|-------|-------|-------|-------|-------|
| Consumption RME (MT) | 7,000 | 6,000 | 7,000 | 7,000 | 7,000 | 6,000 | 9,000 |

The continued promotion of biofuels by the European Commission, the Swedish government and private companies points to increasing consumption in the coming years.

### Increased Biodiesel Production Good for Swedish Rapeseed Farmers

Sweden's rapeseed harvested area in 2005 totaled about 80,000 hectares. Should Karlshamn meet their increased production of 40,000 MT of RME with domestic rapeseed, the area harvested would need to increase by 30,000 hectares.

Swedish rapeseed growers see this as a great opportunity. The area under winter rapeseed in 2005 did, indeed, increase by 40% to 50,000 hectares. However, the increased demand for rapeseed from the planned RME production in Perstorp is expected to be met through imports.

## BIOFUELS IN FINLAND

### Finland Leading in Utilizing Renewable Energy Sources

Finland is one of the world's leading countries in the utilization of renewable energy sources, especially bioenergy. Wood and wood-based fuels play an important role in Finland's energy system. Finland's geographic and climatic features, as well as the important role energy-intensive industries play in the economy, have spurred the development of efficient energy systems. Effluents produced by industrial timber residues such as sawdust and bark are the major bioenergy source used mainly for heat and power production for the industry. The pulp and paper industry supplies over two-fifths of its heat and electricity requirements by utilizing solid and liquid wood residue.

These renewable energy sources account for nearly one-quarter of Finland's total energy consumption. In power production, their share is close to 30%. Bioenergy, particularly wood and wood-based fuels, in addition to hydropower, wind power and solar energy are the most important forms of renewable energy in Finland.

Although Finland is a big consumer of bioenergy, the share of bioenergy produced from agricultural products is small. Finland's total agricultural land area is 2.5 million hectares. It is estimated that a maximum of 0.5 million hectares of Finnish agricultural land will be set-aside from conventional farming over the next few years. The set-aside area is currently about 150,000 hectares. Among the different arable crops, reed canary grass has proved to be the best energy producer in Finland. The technology needed for production and utilization already exists and could be employed for large-scale heat and power production. Currently, 4,000 hectares of reed canary grass is cultivated for energy purpose by Vapo Oy and Pohjolan Voima Oy. Reed canary grass planted area is on the increase.

### Action Plan for Renewable Energy Resources

The Finnish government's Action Plan for Renewable Energy Sources, approved in 1999 and updated in 2002, sets the goal to make energy produced with renewable energy sources competitive on the energy market. The promotion program is part of Finland's National Climate Strategy. The goal of the Action Plan for Renewable Energy Sources is to double the use of renewable energy sources by the year 2025, as compared to the 1995 level, when renewable energy accounted for 21% of total energy consumption. By 2010, the share of renewable energy sources is to be increased by 50% from the 1995 level. Within this program, the Finnish government's key measures to promote the use of renewable energy sources are reduced energy taxation, investment subsidies and aid for the production chain of forest-converted chips.

### Ethanol and RME in Finland

While Finland is leading in utilizing renewable energy sources, it is less successful when it comes to using biofuels for transportation. While the EU has established the goal that biofuels should constitute 2% of total fuel use for transport in 2005, Finland has set its own goal at 0.1%. Finnish consumption of liquid biofuel is moderate but increasing rather quickly. In 2002, Finnish consumption of ethanol and biodiesel totaled 1,230 MT; in 2003 it was 6,160 MT.



According to the Finnish government, the potential for crop-based production of ethanol and biodiesel derived from domestic raw material is almost negligible. Finland produces moderate quantities of ethanol (ETBE) for blending with gas. Monthly production currently amounts to around 9 million liters. Production is based on imported raw material and is subsequently exported. Ethanol produced from Finnish raw material (usually barley) cannot compete with ethanol on the world market (Brazil).

While prospects for Finnish ethanol production seem rather dim, prospects for biodiesel production are considered to be better. The leading Nordic energy company Fortum has decided to build a biodiesel plant with a production capacity of 170,000 MT in Finland. Production is expected to start in 2007 and will most likely be based on imported animal fats and plant oils. Finland's entire domestic production of turnip rape is used by the food industry. The current turnip rape acreage only supplies a part of the food industry's needs, and large quantities are imported.

## **BIOFUELS IN LATVIA AND ESTONIA**

The use of renewable energy in Estonia and Latvia is currently low but both countries are exploring the potential for wood and other renewable energy sources.

Latvia's fuel industry is showing increased interest in producing biodiesel. The company SIA BioVenta plans to start production of 100,000 MT by the end of 2006. In addition, the company SIA ECO DIESEL plans to start operating a biodiesel plant in 2007 with a capacity of 80,000 MT. Together, these two Latvian biodiesel plants would consume 550,000 MT of rapeseed per year. While most of this rapeseed will be imported, some of it will be grown domestically.